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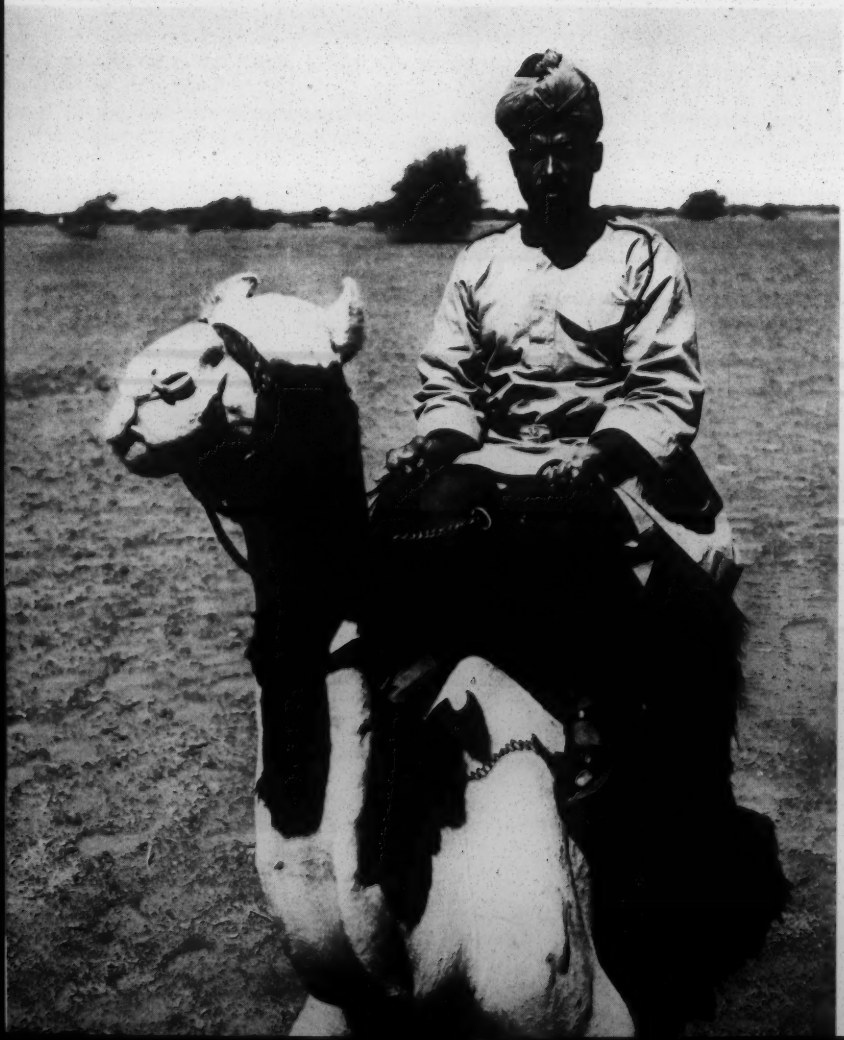
- Khartoum, Where the Niles Meet
- Ireland Concentrates on Industry
- Towboat—River Work Horse
- New Light on Maya Civilization
- Daring Dive Into an Ancient Well

SUDANESE "Mountie" sits astride his swift, white camel. Desert patrolmen keep order among nomads in areas stretching beyond Khartoum.

W. ROBERT MOORE, NATIONAL GEOGRAPHIC STAFF





UMI

buildings along its narrow, winding streets live many government workers, who commute in green trolley cars across the bridge, or by crowded boat. Their offices open early to avoid the midday heat, which may burn as high as 115 degrees.

Brown Arabs in white turbans mingle with black Africans from the south, with British, Greek, and Syrian minorities.

Some light industry—soap-making, tanning, printing, leatherwork, pottery—is carried on in the twin cities, but the chief financial interest is trade. Land and river routes converge to give Khartoum-Omdurman an important place in East African commerce.

The Nile would be a perfect highway to the north through Egypt to the Mediterranean Sea, but it is obstructed by cataracts. A railroad runs to Wadi Halfa near the Egyptian border, where Nile transport is available. Another line cuts northeast through desert to Port Sudan on the Red Sea. South of Khartoum both White and Blue Niles can be navigated. Steamers bring in cotton, grain, gum arabic, and hides.

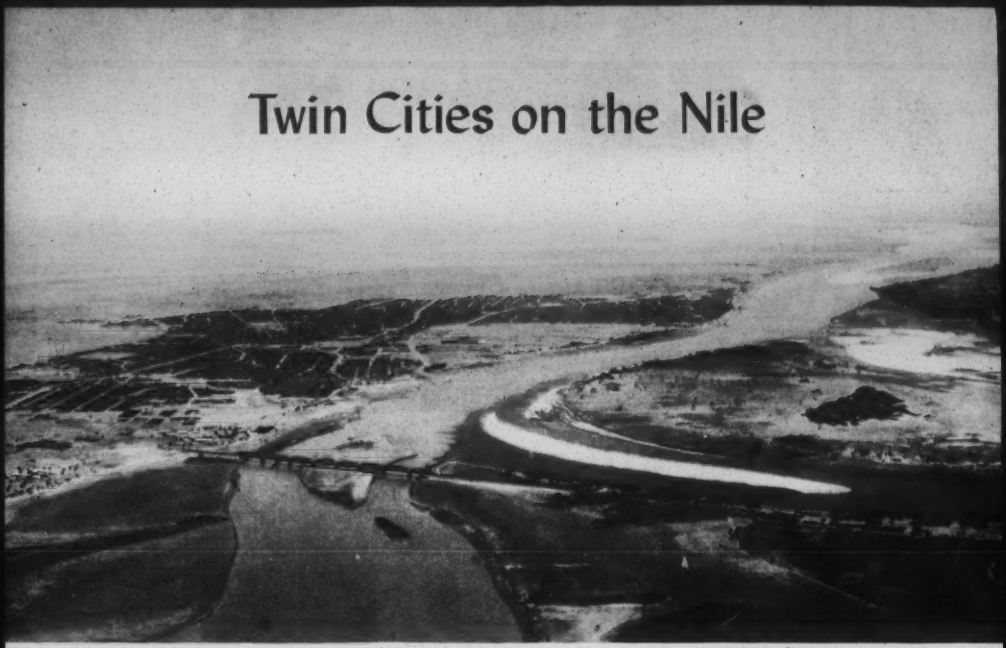
In the wide, flat triangle of land between the rivers lies El Gezira, where Nile water irrigates a million acres to produce some of the world's finest extra-long-staple cotton, the country's chief source of wealth.

Over all flies the Sudanese flag with three stripes: Nile blue, desert yellow, and farm green.

W. ROBERT MOORE, NATIONAL GEOGRAPHIC STAFF

C. TRIESCHMANN, BLACK STAR

# Twin Cities on the Nile



U. S. ARMY AIR TRANSPORT COMMAND

DEEP IN THE SUDAN, where Arab Africa shades into Black Africa, two rivers and three cultures flow together to create a pair of cities.

Khartoum and Omdurman, like Minneapolis and St. Paul half a world away, face each other across a mighty river. Khartoum (partly visible at lower right in the photograph above) is the capital of the three-year-old independent Republic of the Sudan.

Omdurman (upper left in the picture), which is larger, serves as a dormitory for government workers, as well as a center of Sudanese religious and cultural life.

Between them the sluggish White Nile, meandering from the south, joins the tumbling Blue Nile from the southeast to form the Nile itself.

Linked to the Arab World by its predominant Arabic language and Moslem religion, Khartoum also bears the stamp of Dark Africa. The city's name means "elephant's trunk," taken from the shape of the promontory on which it stands. The elephant is its coat of arms.

European influence, while not warmly welcome, appears likely to remain. The young government has decreed the removal of statues of British generals of the last century, including Lord Kitchener and General Charles ("Chinese") Gordon on his bronze camel (bottom).

In another reaction against colonial control, key Englishmen who worked on after independence have now been replaced by Sudanese.

But Sudan will not be able to rub out the British mark entirely. Kitchener laid out Khartoum on the lines of the British flag, and the new University of Khartoum grew out of Gordon College.

Low, balconied government buildings and pleasant villas for senior civil servants line Khartoum's avenues. Some 87,000 people live there.

Each morning donkeys clop into town, bringing milk and produce from irrigated gardens along the river banks. Hawkers at the Abbas Square market (below) haggle over prices.

Omdurman, across the river, is larger, with 132,000 people, and is more Sudanese, less Western. In single-story mud

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DOROTHEA JONES

Historically, Ireland has had little capital for investment in factories. Now the government is pushing an intensive campaign to lure foreign concerns. The Ford Motor Company, for example, has a plant in Cork. Last year, entering the American market, it shipped to this country about $3,000,000 worth of automobiles. They came in an Irish ship, one of a fleet the Irish are building.

In the past four years some 30 new factories have gone up, some built by German, Belgian, British, Danish, Dutch, and Swiss interests. The Irish government will pay two-thirds of the cost of the factory if it will offer substantial employment and if most of the production is for export.

Setting up an office (Ireland House) in New York City, government representatives stand ready to fly to American executives interested in establishing new industries in Ireland.

Joseph F. Shields, counselor of the Irish Embassy in Washington, D. C., says: "We had to start from scratch. In 1926, when Ireland took her rightful place among the nations of the earth, the value of manufactured goods was 23 million pounds sterling.

"Today, it is 135 million."

A symbol of the new Ireland is the contrast between the Galway Fair, where horses and pigs are traded (above), and the busy streets of Dublin, below. Such fairs are still held, and probably always will be, but their numbers are decreasing. Growing Dublin is a center of the new industrialization. F.S.

NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. SISSON

NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. SISSON

# IRELAND

## Industry, Tourism Bolster Farm Economy

SHEEP BLEATING through the scenic Gap of Dunloe walk toward a new Ireland that puts more emphasis on building than beauty.

Bypassed by the Industrial Revolution because of the restrictive policies of the British who then occupied the country, and hampered by two world wars, the Irish have fought hard to build up their industries since achieving freedom in 1922.

Although the Republic is chiefly agricultural and almost certain to remain so, giant strides have been made on the industrial front. Coupled with them are intensive campaigns to attract tourists and promote the sale of Irish goods abroad.

Wool from sheep like these, for example, may be processed into Ireland's famous tweeds, long a staple of cottage industry, especially in County Donegal, which stretches greenly along the rock-fringed northwest coast. There the tweeds are being produced on a larger scale, for export to the United States and other countries. Mechanization and an increase in home weaving help Ireland's trade position and provide employment for her work-hungry people.

Other production is being increased. Irish tweed and linen, for example, are the foundation of a relatively young enterprise, fashion designing. Dublin, in a small way, is challenging Paris and Rome as a women's fashion center.

Traditional crafts are being expanded with an eye to export. Cured bacon from "Paddy's pigs," such as those below, is one. Waterford crystal glassware, stained glass, and religious objects, as well as chocolates, cakes, and jams have been added to the country's dollar-earning exports.

Poor in coal, Ireland has turned to other sources of power. Hydroelectric dams wring kilowatts from the River Shannon and lesser streams. New installations are proving more and more efficient in the burning of peat, the only fuel the island has in any abundance.

NGS MAP

STANDARD OIL COMPANY (N.J.)

DECK HAND on an oil tow uses a megaphone to sing out depth soundings to pilothouse 650 feet astern. Hand "lead" is still used in tight spots.

diesel freight locomotive. It can push its enormous load upstream against a strong current at about four miles per hour.

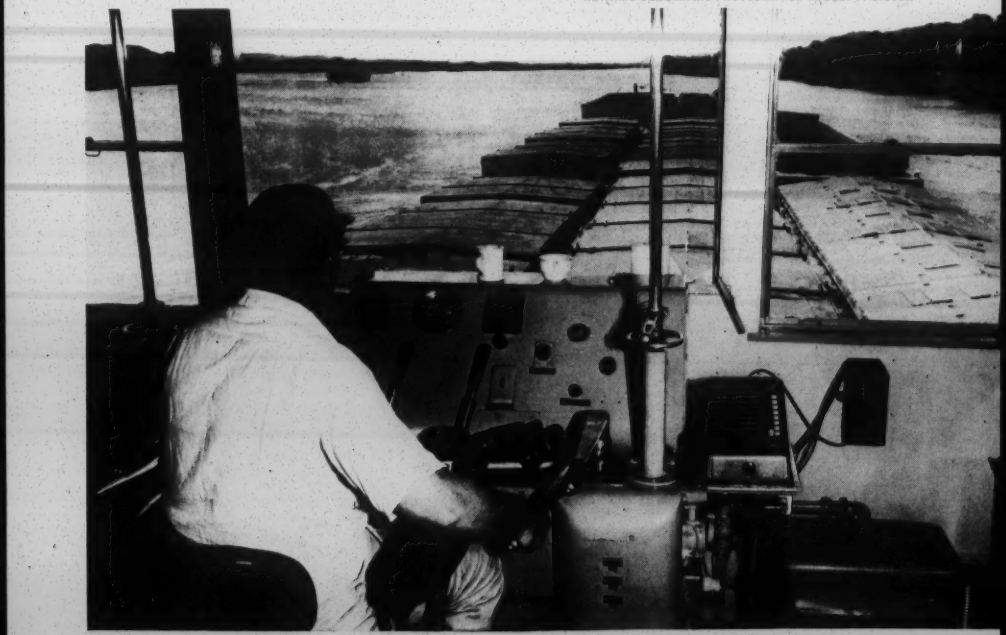
If this doesn't sound impressive, you have only to realize that one of the larger tows may equal 500 freight carloads in bulk. Under way, its momentum is so great its pilot cannot bring a big tow to a halt in less than a quarter of a mile.

The pilot reigns supreme. He tolerates no distractions in the pilothouse. Mark Twain, himself a Mississippi pilot, wrote: "There's only one way to be a pilot and that is to get this entire river by heart." Even with an imposing array of electronic aids at his finger tips, the pilot still must know his currents, winds, and channels.

On one of the largest towboats he may control four engines, four propellers, ten rudders, two searchlights, a Fathometer to give depth, radar to "see" through dark or fog, a radiotelephone, a whistle, and his teletalk (at his right hand, below) that lets him talk to his engine room gang, a lookout posted on the leading barge, or the cook in the galley. A.P.M.

See "The Upper Mississippi" in the November, 1958, *National Geographic Magazine*.

NATIONAL GEOGRAPHIC PHOTOGRAPHER ROBERT F. SISSON





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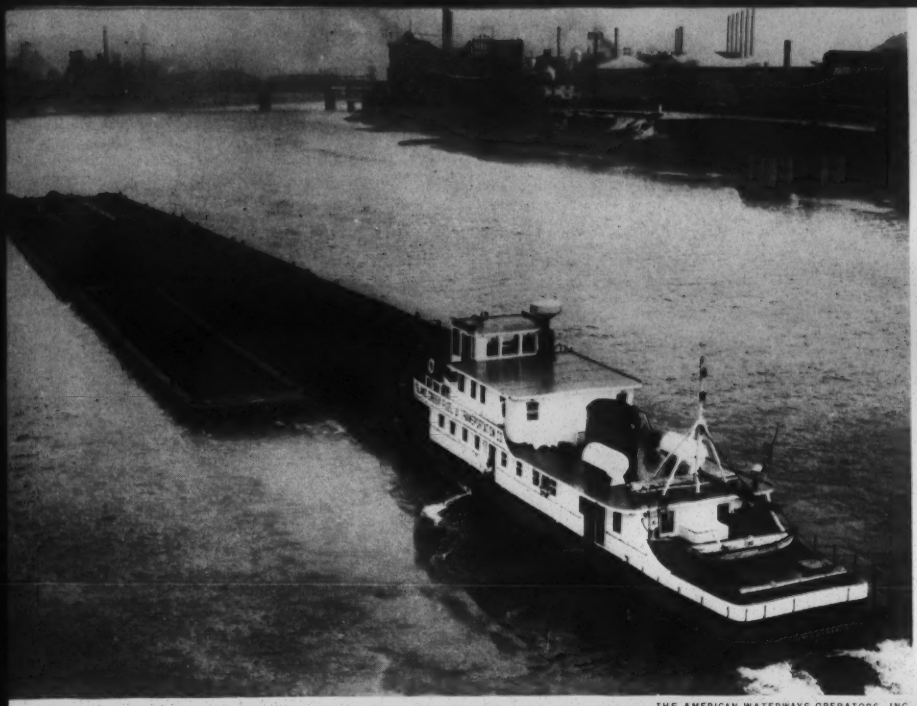


THE AMERICAN WATERWAYS OPERATORS, INC.

# Locomotive of the Rivers

CHURNING AGAINST the current a broad-shouldered towboat prods its string of barges toward a steel mill on the Ohio River. After depositing the 8,100 tons of coal represented by his nine barges, the pilot may hitch his boat behind an even larger tow of steel products for the return voyage, a trip which could take him to New Orleans, 1,400 miles downstream from Cincinnati (above).

The square-cut diesel towboat is the locomotive of the inland waterways. It is the prime agent of a quiet revolution on the rivers that has surpassed even the golden age of steamboating. Revived by World War II needs, river traffic has more than doubled. Today, commercial traffic on the approximately 29,000 miles of navigable inland or protected waterways accounts for one-sixth of all freight hauled within the United States. It is possible for water-borne cargo to make a complete circuit around the eastern half of the country. It moves up the Mississippi and Illinois Rivers to the Great Lakes, eastward by lake and canal to the Hudson River, south along the Atlantic Intracoastal Waterway and west along the Gulf Intracoastal Waterway to New Orleans.

The Mississippi and its tributaries form the number-one inland water turnpike. Towboats do a busy trade along its spreading branches, which drain 40 percent of the United States. Heading toward the Gulf, tows push coal from West Virginia, Pennsylvania, and Kentucky; grain from the corn belt; and steel from Pittsburgh and Gary. New Orleans transships many cargoes to foreign ports. Returning upstream, heaped barges bring South American coffee, nitrates, and bauxite, Cuban sugar, Manila hemp, Pakistan jute, and Pacific coast canned goods.

The towboat is misnamed. It doesn't tow, it pushes. Barges are lashed together with steel cables into one rigid raft. The skipper guides his boat around behind the raft and orders deck hands to lash it tightly to barges on either side. Thus secured, he can guide the tow with the slightest touch on his steering lever.

Under way, the big boat trembles with power. Many a modern towboat packs more horsepower than the most powerful

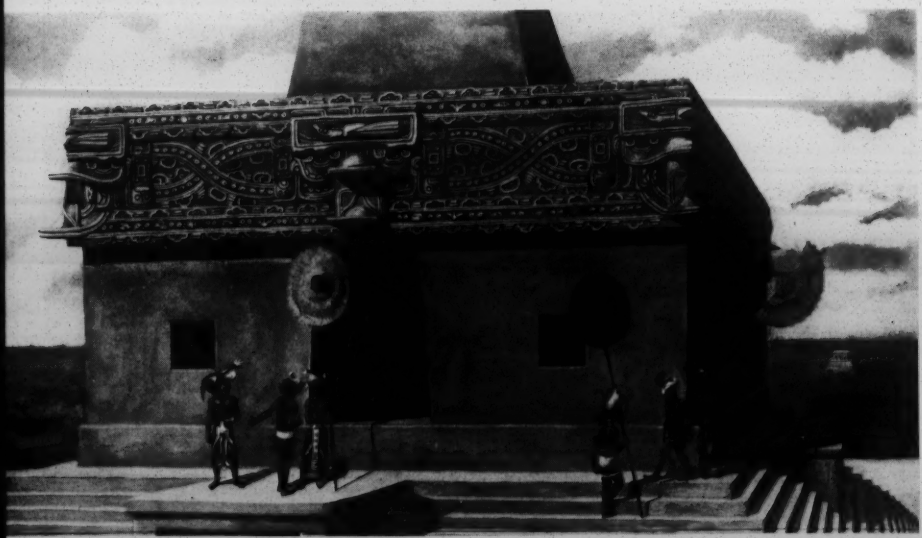
With shovels and Aqua-Lungs (see next story), the expedition has opened new perspectives into the dim story of the Maya.

Thorny scrub hides the stones of the ancient city so vast it will require four years of surveying even to map. Dr. E. Wyllys Andrews, leader of the expedition, estimates that the green coverlet hides some 20 square miles of ruins.

The time-wracked city had its great white way (above). Working with only stone tools, the Maya erected a causeway a mile and a half long. Four automobiles could drive it abreast. Giant paved decks that once supported imposing temples fan out alongside. When the architects finished, they capped the whole thing in white cement.

The Maya, with no vehicles, would seem to have little use for the vast avenue. Dr. Andrews believes they built it to enhance their elaborate religious ceremonies, or simply because it would look good.

One of the richest finds of the expedition was the Temple of the Seven Dolls (above), named for figurines found beneath its floor. Fragments of stucco and stone, photographed and sketched, guided staff artist Bates Littlehales in his re-creation of the temple as it appeared some 1,450 years ago. Under its frieze, priests of the Sun God await human sacrifices whose hearts they will tear out as worshippers throng the plaza below. F.S.



PHOTOGRAPHS AND PAINTING BY NATIONAL GEOGRAPHIC PHOTOGRAPHER BATES LITTLEHALES

# THE MAYA—New Clues to an Old Puzzle

STRIPPING RUBBLE from a long-buried temple of their ancestors, modern Maya workers uncover remnants of the most brilliant culture in ancient America.

The Maya were skilled mathematicians, astronomers, architects, and calendar makers. Their civilization flourished on the Yucatán Peninsula (map below) long before the birth of Christ. By the 16th century, when the Spaniards invaded, it had withered from causes archeologists can only surmise. Now forest covers most of its relics, and wild deer and jaguars play lethal hide-and-seek in the courts of the Sun God.

Unraveling the story of this glorious rise and sad decline is like working a jigsaw puzzle—with most of the pieces missing and some that don't fit.

New and important pieces have been added by a National Geographic Society-Tulane University expedition, now in its third season of work among the ruins of mighty Dzibilchaltun (pronounced Dzeeb-eel-chal-*toon*). It is emerging as possibly the largest and longest inhabited city of ancient America.

For 10 seconds I felt black panic. Then reason returned. Inhaling deeply, I rose to the arched roof of the tunnel and clung there like a fly. As the roil subsided, it left a foot of relatively clear water under the roof. Bates's light wavered toward me.

When we emerged into the dazzling sunlight, I asked Littlehales if he knew why the mud had boiled up so suddenly.

"It was this," he said, holding up the broken neck of a jar, our first artifact. "I saw it lying half buried in the mud. When I tugged at it, the ooze spurted up."

At 60 feet we struck a rich lode. Pieces and whole necks of earthenware pots lay thick among the tumbled rubble.

Dr. E. Wyllys Andrews, our expedition leader, had always maintained that the objects found in the cenote had been accidentally dropped into the water by women who had come to draw water.

But we began to find things that were not entirely utilitarian —a clay flute, a miniature molded head, obsidian flakes, bone noseplugs, and human bones.

Possibly the bones were of victims of drowning or even evidence of pre-Columbian murders. But the increasing numbers of nonutilitarian objects, in addition to the bones, made Dr. Andrews think that Xlacah may have had a religious significance to the Maya.

On the slope I found the handsomest whole jar of the season. Fortunately it lay mouth down, and so was easier to extricate in one piece. I left it for another diver to dig out while I photographed him (right).

LUIS MARDEN, NATIONAL GEOGRAPHIC STAFF

One day Littlehales and I decided to see how far we could penetrate into the cavern at the bottom of the cenote. Soon the cloud of ooze swirled around us. My depth gauge read 144 feet.

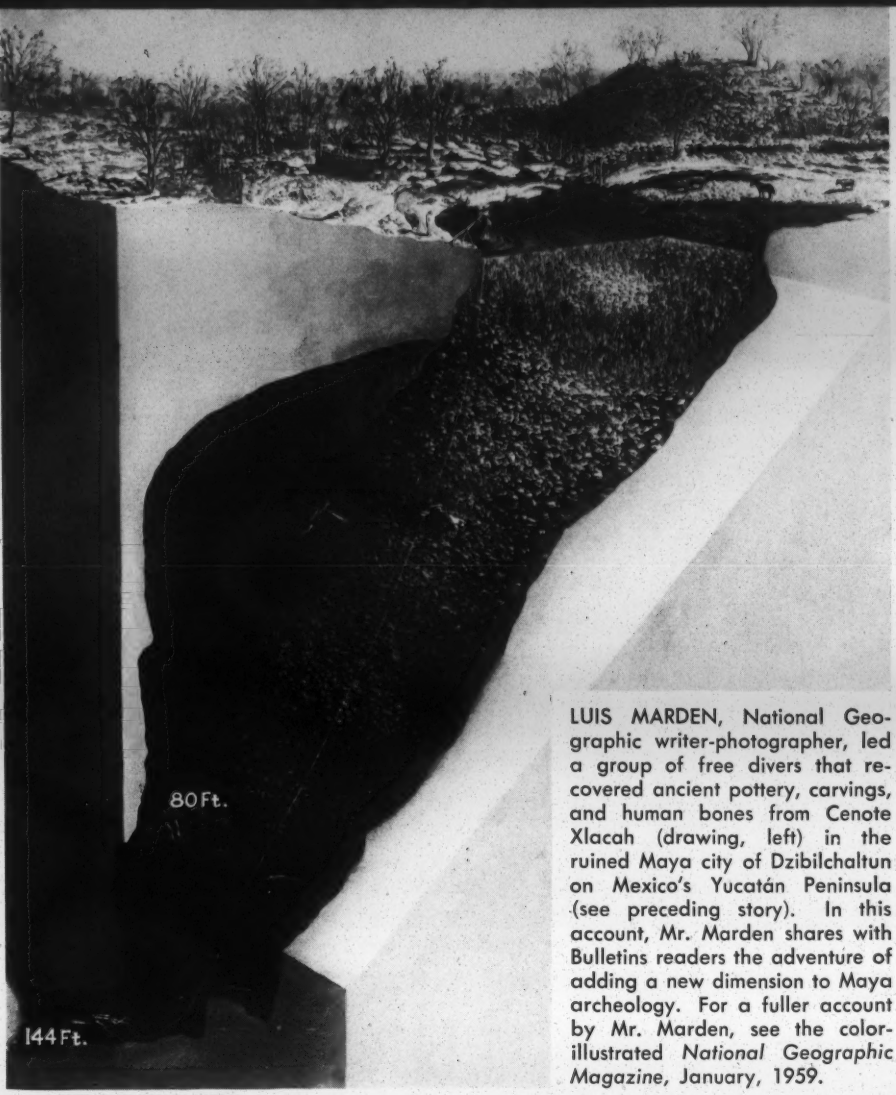
We remained only 15 minutes, then swam back to the outer amphitheater and rose at the then-prescribed rate of 25 feet per minute. If a diver comes up too fast, he gets the bends—gas in tissues with blood turning to bubbles, causing pain, paralysis, or death.

Within five minutes of emerging, I felt a slight pain in my right arm. Quickly I put on a fresh tank of air and went down to 60 feet, where I stayed for 10 minutes, then came up gradually. Still I felt the pain, and so went down a second time. When I rose, again by stages, the pain returned. By now I was blue with cold.

The pain became almost unbearable. There was no doubt now; for the first time in 17 years of diving I had the bends.

By coincidence an engineer friend, Melvin Art, had mentioned just the night before that he could rig an emergency recompression chamber.

To a square-sided oil storage tank a pressure gauge and air hose were connected. Bates and I lowered ourselves into the tank. Littlehales felt no symptoms but decided to take the treatment too. Mel handed down a flashlight and hammer, and then the men slammed down the cover and began to twist home the nuts. The clangor inside was earsplitting. Air hissed in.




PAINTING BY PETER V. BIANCHI

LUIS MARDEN, National Geographic writer-photographer, led a group of free divers that recovered ancient pottery, carvings, and human bones from Cenote Xlacah (drawing, left) in the ruined Maya city of Dzibilchaltun on Mexico's Yucatán Peninsula (see preceding story). In this account, Mr. Marden shares with Bulletins readers the adventure of adding a new dimension to Maya archeology. For a fuller account by Mr. Marden, see the color-illustrated *National Geographic Magazine*, January, 1959.

# *Risking the Depths for Maya Treasures*

*By Luis Marden, National Geographic Staff*

AS I SAT ON THE EDGE of the big natural well, I felt that my rubber-flippered feet had already crossed the frontier of the ancient Maya world.

I clenched the Aqua-Lung's rubber mouthpiece between my teeth, took a breath of bottled air, slid into the water, and thrust downward toward the black depths. Below me in the rubble lay carved stones, human handiwork that had tumbled into the *cenote* centuries before.

At 120 feet, Bates Littlehales, my diving companion, and I finned into the mouth of a tunnel. We swam close to the bottom muck to pass under the low arch. Suddenly the oily black stuff whirled up before my mask. I turned my flashlight full in my eyes and could see nothing. I was in utter blackness and could not tell up from down.

## Geographic Divers Emerge from Below

Continued from page 167

I could feel that we were not under very great pressure, so I banged three times with the hammer, signaling "more air." The valves opened and air roared in. Almost immediately the roar died to a hiss.

After 20 minutes we signaled for more air but none came, so we signaled "take us up." The air screamed out, the manhole cover clanged aside, and we climbed back to the outer air. My arm still ached.

"The tank wouldn't take any more pressure," Mel said. "The sides began to bulge." If the tank had burst, the men standing round it would have been seriously injured, if not killed, and I should probably have had a permanently paralyzed right arm from the explosive decompression.

MELVILLE BELL GROSVENOR

"I've got a cylindrical oil tank that should stand a lot more pressure," Mel said.

This tank was big enough for only one man. Bates still showed no signs of bends, so I entered alone. When the cover was bolted fast, I was in Stygian darkness. The air hissed in, the temperature soared, and sweat streamed off my body in rivulets.

My time in that steel coffin was one of the least pleasant experiences of my life. I would not recommend it to anyone with claustrophobic tendencies.

When, after centuries of time, I heard the six-blow hammer signal "We're bringing you up," I felt as though I were emerging from a dungeon in which I had lain for years. To my surprise, I found I had been in the tank only 6 hours and 12 minutes. The treatment temporarily alleviated, but did not cure, the bends.

That night I slept under strong sedatives. When I awoke, I found Littlehales stretched stiffly on his bed. He complained of pain at the base of the spine and could not sit up. If this was also the bends, he was in danger of complete paralysis.

There was no choice. The Naval Attaché in Mexico City sent out a radio call. Within the hour we received word that an aircraft would arrive that afternoon to evacuate us to Florida and a Navy recompression chamber. Because of the long delay before treatment, we spent 44 hours and 26 minutes in the gray tank. Thanks to the expert care of the Navy, we emerged completely cured.

When I returned to Yucatán to finish the job some of the Indians seemed surprised to see me. I asked why.

"They fully expected to see you get in trouble," was the answer. "They say their patroness, St. Ursula, lives at the bottom of the cenote and resents anyone digging up the bones and household goods of their ancestors."